

Appendix B

Glossary

Adaptive management: A systematic process for continually improving management policies and practices by learning from the outcomes of operational programs. Active adaptive management employs management programs that are designed to experimentally compare selected policies or practices, by evaluating alternative hypotheses about the system being managed.

Adjudication: A process whereby the quantity and priority date of all water rights in a given area are determined either by civil action in a court of law, or by statutory adjudication before the State Water Resources Control Board.

Aggradation: In reference to streams, the raising of stream beds or flood plains by deposition of sediment eroded and transported from upstream.

Aggregate extraction: The mining of sand, gravel, and (sometimes) bedrock from a river or stream.

Alevin: Stage in the life cycle of salmon following emergence from the egg stage, characterized by the presence of a yolk sac attached to the body.

Allele: Any of the different forms of a gene.

Allele frequency: The proportion of a particular allele in a population.

Allozyme: Variant form of an enzyme encoded by a particular allele at a given locus. Allozymes can often be distinguished by protein electrophoresis.

Alluvial: Composed of material deposited by running water.

Anadromous: Pertaining to fish that spend part of their life cycle in the ocean and return to freshwater streams to spawn, for example salmon, trout, and shad.

Appropriated water: A quantity of water authorized for a specific use.

Appropriative water rights: Right to use a given quantity of water for reasonable and beneficial use in a prescribed place in order of priority based on the time water is first put to use. Since December 19, 1914, the exclusive method for establishing an appropriative water right is through the permit system administered by the State Water Resources Control Board. Percolating groundwater is governed by a separate body of law not addressed here.

Artificial propagation: Human assistance in the reproduction of an organism. In Pacific salmon, artificial propagation may include spawning and rearing in hatcheries, stock transfers, creation of spawning habitat, egg bank programs, captive broodstock programs, and cryopreservation of gametes.

Benthic: Belonging or pertaining to the bottom sediment zone of a body of water.

Biological refugia: For Pacific salmon, parts of the freshwater habitat unperturbed by human activities or other factors that would diminish the natural production of a population.

Brood year: Population of coho salmon that perpetuates itself by spawning in three-year intervals. Due to the rigid three-year life cycle of coho salmon, any given stream may provide habitat for three temporally separated populations, or brood years, that are largely reproductively independent from each other (with the exception of precocious males and females, called jacks and jills, respectively, that engage in spawning after two years and thus provide gene flow between brood years). When the spawning season spans portions of more than one year, as it does for coho salmon, the brood year is identified by the year in which spawning began. For example, offspring of coho salmon that spawned in 1996-1997 are identified as “brood year 1996.” Because most coho salmon of a brood year return to spawn after one summer of freshwater life and two summers of ocean life, a brood year tends to form a distinct genetic lineage.

By-catch: Non-target fish or other organisms caught in a particular fishery. Among Pacific salmon, coho salmon may constitute part of the by-catch of the commercial Chinook salmon fishery.

Carrying capacity: The maximum equilibrium number of individuals of a particular species that can be supported indefinitely in a given environment. *Abbr.: K.*

Cohort: A group of fish that hatched during a given spawning season. When the spawning season spans portions of more than one year, as it does for coho salmon, the brood year is identified by the year in which spawning began. For example, offspring of coho salmon that spawned in 1996-1997 are identified as “brood year 1996.” (Synonym: brood year).

Cohort failure: Extinction of a cohort (year-class) of fish due to either a lack of spawning in that year or the failure of any offspring of a spawning event to survive. Also called brood-year extinction.

Conservation hatchery: Fish hatchery that follows practices designed to stabilize and increase the size of a natural population while maintaining its phenotypic characteristics and genotypic integrity.

Conspecific: Belonging to the same species.

Cryopreservation: Preservation of living gametes at very low temperature; typically, freezing and storage of sperm in liquid nitrogen for later use in spawning.

Dendrogram: A branching diagram showing hierarchical structure in a data set resulting from cluster analysis (a type of statistical analysis for grouping individuals or units based on quantifiable similarities). Dendrograms are often used to show the genetic relationships among populations or higher taxa.

Distribution: The number of, and geographic relationship among streams inhabited by coho salmon within the ESU and species (see range).

Domestication selection: Used in management of genetic resources to express information about expected rates of random genetic change due to inbreeding and/or genetic drift. The size of a hypothetical ideal population with the same amount of random genetic change as the actual population experiences. Typically the effective population size is lower than the census population size. *Abbr.: NE.*

Downlisting: The moving of a species from the “Endangered” list to the “Threatened” list under CESA as a result of recovery of population sizes to the point where danger of extinction is less extreme than before, although continued protection is still warranted.

Effective population size: The effective number of breeding individuals in a population. The size of a hypothetical idealized population that would exhibit the same amount of genetic drift

and loss of genetic variation as the actual population. Typically the effective population size is lower than the actual or census population size. *Abbr.: N_e .*

El Niño/Southern Oscillation (ENSO): A term describing fluctuations of the ocean-atmosphere system in the tropical Pacific that can have secondary effects in the north Pacific range of coho salmon. During El Niño conditions the normal westerly trade winds across the tropical Pacific relax, creating (among many other effects) a rise in sea-surface temperatures in the eastern Pacific along South America. During strong El Niño events, sea surface temperatures along California may also increase and can contribute to poor ocean survival of coho salmon. The reversal of this condition (the Southern Oscillation or La Niña) produces a decrease in sea surface temperatures and is often associated with good ocean survival of coho salmon. Typical ENSO events are of relatively short duration, lasting between 6 to 18 months (see Pacific (Inter)Decadal Oscillation).

Embeddedness: The degree to which rocks and gravel are surrounded or covered by fine sediment on a stream or lake bottom.

Emigration: Seaward migration of salmon from their natal streams to the ocean. Also called “outmigration.”

Entrainment: The incidental trapping of fish and other organisms in the water diverted from a stream or other source for purposes of agricultural irrigation, cooling of power plants, or other industrial activity.

Epibenthic: Belonging or pertaining to the top surface of the bottom sediment zone of a body of water.

Escapement: In reference to Pacific salmon, the number of fish of a population that return to a stream to spawn (spawning escapement).

Estuary: The seaward end or the widened tidal mouth of a river where fresh water comes into contact with seawater and where tidal effects are evident.

Evolutionarily Significant Unit (ESU): A population or group of populations that is considered distinct, and hence a species, for purposes of the Endangered Species Act. An ESU must be reproductively isolated from other populations of the same species and must represent an important component in the evolutionary legacy of the species.

Eutrophic: Pertaining to a lake or other body of water characterized by high concentrations of nutrients such as nitrogen and phosphorus resulting in high productivity. Eutrophic waters are often shallow and sometimes experience algal blooms and periods of low oxygen concentrations.

Exotic: An organism that is not native to the area where it is found. A non-native or non-indigenous species, often introduced as a result of human activities.

Extinction: In evolutionary biology, the failure of a group of organisms of variable size and inclusiveness (e.g., ranging from local geographic or temporally defined groups to species) to have surviving descendents.

Extinction risk: In this document, the probability that a given population will become extinct within 100 years. Low probability of extinction is arbitrarily defined for this purpose as 5% over 100 years.

Fecundity: In salmon, the number of eggs produced by a female.

Fish screen: A porous barrier placed across the inlet or outlet of a lake or stream or across the opening of a water diversion structure in a stream to prevent the passage of fish.

Fitness: The probability of an organism to reach reproductive age and produce viable offspring. For a population, fitness is the frequency distribution of reproductive success of sexually mature adults.

Fragmentation: In reference to salmon, the loss of connection of freshwater habitat due to migration barriers such as impassable dams or inadequate water quantity or quality, resulting in the inability of the fish to reach and fully utilize the habitat necessary to complete their life cycle and maintain natural levels of productivity.

Freshet (or Storm Flow): Rapid temporary rise in stream discharge caused by heavy rain or rapid melting of snow or ice.

Fry: Stage in the life cycle of salmon following the “alevin” stage, characterized by the loss of the yolk sac and beginning of feeding on external prey.

Gene flow: The introduction of genes into the gene pool of a population due to migration of individuals between populations.

Genetic drift: Random changes in allele frequencies due to the sampling error associated with a moderate to small number of matings. Genetic drift typically results in the loss of genetic variation (e.g., loss of rare alleles or decrease of heterozygosity) and increases as the effective population size (N_e) decreases.

Head Gate: The gate that controls water flow into irrigation canals and ditches; the controls or gate at the entrance to a canal or conduit system. Also, the diversion structure that controls the flow rate from a conveyance system (canals and laterals) into the farm conveyance system.

Heterozygosity: The fraction of individuals in a population that are heterozygous (having two different alleles) at a particular locus. Also, the fraction of heterozygous loci in the genome of an individual.

Hydrograph: A graphic representation or plot of changes in the flow of water or in the elevation of water level plotted against time. A hydrograph may contain information on stage, flow, velocity, and other hydraulic properties of water.

Hydrologic connectivity: A direct connection between run-off to a stream and development sites, typically roads, that contributes sediment or other pollutants to the stream.

Hyporheic: Pertaining to the zone of substrate in a stream bottom that extends 1 to 2 meters (approx. 3 to 6 ft.) below the surface of the stream bed.

Immigration: Migration of salmon from the ocean to their freshwater spawning grounds.

Incidental mortality: The unintentional death of an organism caused during the course of an otherwise lawful activity. In the context of recreational fishing, this refers to coho salmon that die after being caught and released by anglers fishing for other species.

Incidental take: Under CESA, it is the taking of a State-listed or candidate species where the taking is incidental to and not the purpose of carrying out otherwise lawful activities.

Interim actions: Actions contributing to recovery that will be: 1) immediate in their implementation, i.e., within the first five years of implementation of the Recovery Strategy; and 2) do not require legal or regulatory changes. These actions may be of temporary duration to meet an urgent need or they may lay the groundwork for more long-term actions.

Interstices: The physical spaces between gravel or other substrate particles.

Intragravel: Within the gravel substrate of a stream.

Invasive non-native species: Animal or plant species present in an ecosystem where it did not naturally occur and is increasing in number and range with significant negative effects on native animal or plant species.

Key populations: Populations of coho salmon that qualify as likely refugia, source populations, or metapopulations. Generally, key populations are those populations that occur in coho salmon habitat of relatively high quality, with a full complement of year-classes, or with abundances that are high relative to other populations within the same recovery unit, or place them at an insignificant risk of extinction.

Lagoon: Within the range of coho salmon, a lagoon is an estuary that is separated from tidal action during the summer by the formation of a sand bar at its mouth. This is the case in many California coastal streams and rivers.

Large woody debris (LWD): Large, relatively stable woody material usually having a diameter greater than 30 cm (12 inches) and a length greater than 2 m (6 feet) that intrudes into the stream channel.

Locus (Pl.: Loci): The physical location of a gene or other DNA sequence on a chromosome.

Macroinvertebrates: Aquatic invertebrates that conventionally are at least 0.5 mm in length and live primarily on the bottom substrate of streams and rivers. They feed on plant matter, detritus, or smaller animals and, in turn, provide food for larger consumers such as fish.

Maintain: To prevent further decline in the number and size of populations and the amount and quality of their habitat.

Mass wasting: The down-slope movement of rock and soil near the Earth's surface mainly due to the force of gravity. Mass-wasting is an important part of the erosion process, occurring continuously on all slopes. Some mass-wasting processes act very slowly, others occur very suddenly, often with disastrous results. The eroded materials often end up in rivers or streams where they may be transported further downstream.

Metapopulation: A set of largely isolated subpopulations connected by some degree of migration among them.

Microsatellite DNA: DNA sequences consisting of tandem repeats of short oligonucleotide sequences, such as poly-(AT) or poly-(TAGC). The repeats are usually two to five nucleotides long and are inherited in a Mendelian fashion. Analysis of microsatellite inheritance can be used to gain information about microevolutionary processes such as migration and gene flow.

Mine tailings: Mine waste and mine tailings are often used interchangeably to describe the waste material remaining after a mineral commodity is extracted from the host rock(s). Mine tailings more specifically refers to the waste material that results from processing the mineral commodity. True mine tailings usually are high in metals, low in pH, and composed of materials the size of sand to silt. Dredger tailings such as those associated with gold separation activities are usually comprised of unsorted cobbles, gravel, and fine sediments.

Mitigation hatcheries: Fish hatcheries, usually built below flood control or power-generating dams, that are intended to compensate for the loss of upstream spawning habitat and natural fish production resulting from dam construction.

Natural-origin fish: Also called "natural fish." Fish that are offspring of parents that spawned in

the wild. Natural-origin fish spend their entire lives in the natural environment. (See “Hatchery-origin fish”).

Nutrition: An increase in the concentrations of nutrients such as nitrogen and phosphorus in a body of water.

Pacific (Inter)Decadal Oscillation (PDO): The “Pacific Decadal Oscillation” (PDO) describes a long-lived pattern of Pacific climate variability that can affect ocean survival of coho salmon. Unlike El Niño/Southern Oscillation events, which originate in the tropics and last from 6 to 18 months, PDO events originate in the northeastern Pacific and cycle over periods of about 50 years. Within a PDO cycle there may be short lived reversals of conditions. “Warm” or “positive” PDO phases are associated with enhanced ocean productivity in Alaska and inhibited productivity off the west coast of the contiguous United States. “Cold” or “negative” PDO eras have the opposite pattern, and are generally favorable for ocean survival of coho salmon from California. Causes for the PDO are not currently known.

Parr: Stage in the life cycle of salmon following the “fry” stage, characterized by the presence of dark vertical bands on the side of its body.

Population: A group of individuals of the same species that live in the same place at the same time and exhibit some level of reproductive isolation from other such groups. In some contexts, a randomly mating group of individuals that is reproductively isolated from other groups. A population may consist of a single isolated run or more than one connected run. Synonymous with “stock” in this document.

Population risk: Defined here as risks to coho salmon from human activities (range-wide coho salmon population abundance and genetic data are not available). It combines anthropogenic risk factors (e.g., human population density, water diversions, road density) and population parameters (e.g., consistent presence of coho salmon, isolation index for coho salmon populations, and run length of coho salmon populations).

Population viability analysis: Analysis of a species and its population genetic structure to determine the level of independence of the populations. A viable salmonid population has been defined by NOAA Fisheries as “an independent population of any Pacific salmonid (genus *Oncorhynchus*) that has a negligible risk of extinction due to threats from demographic variation, local environmental variation, and genetic diversity changes over a 100-year time frame.”

Probability of extinction: See Extinction Risk.

Properly Functioning Condition (PFC): With regard to conifer LWD recruitment. A concept used by NOAA Fisheries to describe the sustained presence of natural processes leading to habitat conditions that are necessary for the long-term survival and recovery of a fish species through the full range of environmental variation. In terms of conifer LWD recruitment, PFC refers to achieving a natural rate of large conifers falling directly in or sliding downslope to become active in channel processes such as pool formation, sediment retention, or otherwise providing the habitat complexity sufficient to ensure long-term survival of salmonid populations. This rate of LWD recruitment is to be determined by the best available science. (NMFS 1999).

Protect: To ensure the status and integrity of coho salmon populations, habitat, and essential ecological processes.

Pulse flows: Temporarily increased water flow in a river or stream at specific opportune times intended to increase habitat for migrating fish .

Ramped flows: The sequential and gradual, rather than simultaneous, initiation and completion of water diversions from a river or stream to buffer significant changes in water levels and instream flows.

Range: The geographic area and extent within California that is defined by the watersheds where coho salmon were historically (including currently) present.

Recovery: The re-establishment or rehabilitation of a threatened or endangered species to a self-sustaining level in its natural ecosystem.

Recovery supplementation: Short-term artificial propagation designed to reduce the risk of extinction of a small or chaotically fluctuating recovering population in its natural habitat by temporarily increasing population size using conservation hatchery fish, while maintaining genetic diversity and minimizing genetic change in the natural and hatchery populations.

Recovery unit: A geographic and hydrologically distinct area within each ESU that includes a number of related coho salmon populations and which will be the scale at which successful achievement of delisting goals and criteria will be measured and evaluated.

Recruitment: The natural process of replenishing a resource, such as gravel recruitment or recruitment of large woody debris in a stream. With reference to fish and fisheries, recruitment refers to the development and growth of the fish to a point where they enter the fishable stock.

Redd: Nest of a salmon, usually a depression within the gravel substrate of a stream, into which the female deposits her eggs.

Reproductive isolation: Absence of gene flow between a population and other populations of the same species.

Restore: In the context of coho salmon recovery, to return coho salmon to self-sustaining levels within their natural habitat throughout their historic range, or to return habitat attributes (e.g., flow, sediment characteristics, water temperature, water quality and habitat complexity) to a condition that will support the recovery of coho salmon to self-sustaining levels.

Riffle: A shallow rapids where the water flows swiftly over completely or partially submerged obstructions to produce surface agitation. Substrate is usually composed of gravel, pebble, and cobble-sized particles.

Riparian zone: The terrestrial zone adjacent to a water course.

Riprap: A man-made facing layer (protective cover) of stones, rocks, or other hard, durable material for stream-bank protection and stabilization and to reduce erosion.

Run: The spawning adults of a given species that return to a stream during a given season.

Short-term actions: See Interim Actions.

Siltation: The deposition and build-up of silt (detrital rock particle having a diameter in the range of 1/256 to 1/16 mm) that is suspended in a body of water. The term is often used to include larger and smaller sedimentary particles ranging in size from clay to sand.

Sink population or subpopulation: Populations that, within a given metapopulation structure of a species, are characterized by vastly lower productivities than other (source) populations and consistently receive individuals from the source populations through one-way movement of migrants.

Smolt: Stage in the life cycle of salmon following the “parr” stage, characterized by hormonal and other physiological changes that prepare the fish for its seaward migration and life in salt water, the loss of parr marks, and appearance of a silvery color.

Smoltification: Hormonal and other physiological changes associated with the seaward migration of salmon and adaptation to a saltwater environment.

Source population or subpopulation: Populations that, within a given metapopulation structure of a species, are characterized by vastly higher productivities than other (sink) populations and consistently contribute individuals to the sink populations through one-way movement of migrants.

Source-sink relationship: Metapopulation structure in which subpopulations in the source areas have vastly higher productivities than those in the sink areas, and characterized by one-way movement of migrants from the source area to the sink area.

Stock: See Population.

Stock transfer: Human transfer of fish from one location to another, often between separate basins or ESUs.

Stream buffer zone: Riparian zone of specified width that is given some measure of protection from developmental activities such as logging or road construction.

Stream order: Designation of stream segments within a drainage basin; a system of numbering streams according to sequence of tributary size. The smallest perennial tributary is designated as order 1, the junction of two first-order streams produces a stream segment of order 2, etc. The main stream is always of the highest order.

Substrate: Particulate material comprising the bottom of a body of water, such as mud, silt, gravel, or rock.

Suspended sediment: Material (usually clay, silt, and sand) carried for a considerable period of time in suspension without deposition on the bed of the body of water .

Supersaturation: Presence of a solute (e.g., salt or oxygen) in a solvent at levels that exceed saturation for a given set of conditions, especially temperature and pressure.

Tailwater reclamation: The process of collecting irrigation water runoff for reuse in the system. Also called “tailwater recovery.”

Take: “Take” under California law is defined by FGC §86 as “hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill.”

Transferrin: A protein synthesized in the liver that transports iron in the blood to the erythrocytes for use in heme synthesis. Transferrin has been used in the past in immunological procedures such as microcomplement fixation assays to examine the genetic relationship between populations and other related taxa.

Turbidity: Reduced clarity of a liquid due to the presence of suspended matter.

Watershed: The topographic region drained by or contributing water to a stream, river system, or lake.

Watershed recovery unit: See Recovery Unit.